Monthly Progress Report – January 2016
BCA Remedial Investigation
Site # C734138: BMS Syracuse North Campus Restoration Area

Introduction

As required in paragraph XI of the Standard Terms and Conditions of the Brownfield Cleanup Agreement (C734138) between Bristol-Myers Squibb Syracuse (BMS) and New York State Department of Environmental Conservation (NYSDEC) dated October 18, 2011, BMS is submitting this Monthly Progress Report for the period ending January 31, 2016.

Work Completed during Reporting Period

Arcadis and Parratt Wolff installed SVI sampling points and sampled SV and indoor/outdoor air per *Phase 1A RIWP – Soil Vapor Sampling Module,* Addendum and Agency comments with the exception of Building 3.

Action Technical completed Building 31 demolition and foundation removal. OBG provided air monitoring (per CAMP) during foundation removal (logs attached).

BMS submitted and NYSDEC approved top soil source for use in BDA.

Work Anticipated during Next Reporting Period

BMS will schedule a meeting with NYSDOH and NYSDEC to discuss SVI sampling plan for Building 3.

Arcadis and Parratt-Wolff will proceed with decommissioning temporary monitoring wells per *Temporary Monitoring Well Decommissioning Work Plan*. Planned start date is March 1, 2016 (this serves as 10-day notice).

Arcadis will complete validation of soil vapor, sub-slab air, ambient air and indoor air sampling results from laboratory.

Activity Modifications

SVI sampling at Building 3 could not be completed as proposed in *Phase 1A RIWP – Soil Vapor Sampling Module,* Addendum and Agency comments. BMS will arrange meeting with NYSDOH and NYSDEC to discuss and develop alternative sampling plan.

Sampling and Testing Results

Arcadis completed validation of sediment sample results from laboratory. Reports attached.

Project Completion Status – No change in this reporting period.

Unresolved Delays Encountered or Anticipated during Reporting Period – None.

Citizen Participation Plan Activities Undertaken During Reporting Period or Anticipated During the Next Period – None

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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February 1, 2016

John Mosack
Executive Director, General Manager
Bristol-Myers Squibb Company
Mail Stop A-1; Syracuse Operations
Global Manufacturing and Supply
6000 Thompson Road
East Syracuse, NY 13057

Re: Bristol-Myers Squibb Restoration Area
Site ID No. C734138
Village of East Syracuse, Town of DeWitt, Onondaga County
Temporary Monitoring Well Decommissioning Plan

Dear Mr. Mosack:

The New York State Department of Environmental Conservation (Department) and the New York State Department of Health (NYSDOH) have reviewed the Temporary Monitoring Well Decommissioning Plan for the Bristol-Myers Squibb Restoration Area (site), dated December 2015, which was prepared by Arcadis of New York, Inc. (Arcadis) on behalf of the Bristol-Myers Squibb Company (BMS).

The work plan was reviewed along with the email from Arcadis dated January 25, 2016 (Arcadis's email) which clarified how the criteria listed in Section 2 of the work plan would be used in determining if a well would be grouted-in-place or overdrilled. The criteria listed in Section 2 are as follows:

1. Is the well located within an area of concern (as defined in Section 2)?
2. Is the well screened across a geologic unit?
3. Select well couplets will be overdrilled.

The decommissioning method selection as described in the email is as follows:

- "If the first criteria is not met ('No' in Table 1, 4th column), then the well will be grouted-in-place.
- If the first criteria is met, but not the second criteria (either 'No' or 'Yes; however, screen is less than a foot into till unit' in Table 1, 5th column), then the well will be grouted-in-place.
- If the first and second criteria are met, then the well will be overdrilled.

> "In some cases, even though criteria #1 and #2 are not met, the well will be overdrilled based on judgment (*e.g.*, well is part of a 'couplet,' well is proximate to high concentrations)."

It is noted that Figure 2 and Table 2 were not reviewed in detail by the Department or NYSDOH, and, as noted in the work plan, specifics for Phase 2 monitoring wells will be included in a work plan which will be submitted for review by the Department and NYSDOH. Further, additional wells besides those indicated on Figure 2 may be necessary. The Department and NYSDOH understands the primary purpose for including Figure 2 and Table 2 is to indicate that BMS understands that additional investigation into the nature and extent of groundwater contamination is necessary, and that by decommissioning all but one of the current monitoring wells, BMS is not indicating that the remedial investigation is complete, as discussed during a meeting on October 28, 2015.

With that in mind, the work plan must be modified as set forth below.

- Appendix A – Prior to decommissioning each well, the well must be gauged to determine if any non-aqueous phase liquid (NAPL) is present; both light NAPL and dense NAPL. Any NAPL present must be removed and containerized prior to decommissioning.

- Appendix A, Section IV, Overdrilling Method – Step 3 should be conducted prior to Step 2. It is not necessary to allow the grout to set up prior to Step 2.

- The following wells should be overdrilled, based on the evaluation criteria described in the work plan and Arcadis's email, as well as the Department' policy document *CP-43 – Groundwater Monitoring Well Decommissioning Policy* (CP-43) and the reasons outlined below for each.

    - BLD 1-3 – Soil staining was noted during drilling and there were elevated tentatively identified compounds (TICs) in groundwater, along with somewhat elevated levels of target compounds, only slightly less than the threshold established by Arcadis and/or BMS for criterion 1.

    - BLD 1-4A – 1,1,2-trichloro-1,2,2-trifluoroethane was detected at 1,200 micrograms per liter (ug/L) in groundwater, which is greater than threshold for criterion 1. The soil description from 14 feet below ground's surface (bgs) to 20 feet bgs is very similar to the description of the till and the blow counts indicate very hard soil at about 16 feet bgs, indicating this well is screened across a geologic unit.

    - BLD 24A-1 – Triethylamine was detected at 660 ug/L in groundwater.

- SR-4 – Staining was noted in the soil from 8 to 10 feet bgs and dicyclohexylamine (DCHA) was detected in soil at 50 parts per million. DCHA was detected in the vicinity at elevated levels in groundwater.

- SR-5 – DCHA was detected at 890 ug/L in groundwater.

- T-10 – Staining and sheen were noted during drilling; volatile organic compounds were detected at 10.2 parts per million (ppm) by a photoionization detector (PID) in the well headspace prior to sampling in January 2014; acetone, tert-butanol, and ethylene glycol were present in groundwater at concentrations only slightly less than or greater than the threshold for criterion 1; and there was elevated levels of TICs in groundwater.

- T-4 – Acetone was present at 8,100 ug/L in groundwater, which is greater than threshold for criterion 1. The soil description from 12.5 feet bgs to 14.8 feet bgs is similar to the description of the till and the blow counts indicate very hard soil as well, including the interval from 14 to 15.4 feet bgs, indicating this well is screened across a geologic unit.

- T-13 – DCHA was detected at 40,000 ug/L in groundwater and triethylamine (TEA) was detected at 4,600 ug/L in groundwater.

- T-24 – A chemical odor and green staining were noted during drilling. Ammonia was present at elevated concentrations in soil (as compared to other soil samples) and groundwater (only slightly less than the threshold for criterion 1).

Also, while not required, BMS may want to consider grouting BLD 41-1 in-place. Given the difficulty encountered during drilling previously, which resulted in auger refusal, it may be futile to try to overdrill this location.

BMS must obtain and comply with any necessary State, local or federal permits. The Department requires notification at least seven days in advance of field work.

BMS must respond in writing within 15 days of the date of this letter as to whether the work plan will be modified as required, and the modified work plan must be submitted within 30 days of the date of this letter. In the interest of time, if BMS wishes to simply accept these modifications, BMS may respond as such. In that case, this letter and BMS's acceptance letter must be attached to the front of all copies of the work plan.

If you have any questions, please do not hesitate to contact me at 315-426-7411 or joshua.cook@dec.ny.gov.

Sincerely,

Joshua P. Cook, P.E.
Environmental Engineer 2

ec: Harry Warner (NYSDEC)
Joshua Cook (NYSDEC)
Maureen Schuck (NYSDOH)
Richard Jones (NYSDOH)
John Mosack (BMS)
J. Richard Pooler (BMS)
John Killiany (BMS)
Anne Locke (BMS)
David Wright (Arcadis)
Jo Ann Robertson (Arcadis)

ARCADIS Design & Consultancy for natural and built assets

Bristol-Myers Squibb Company

TEMPORARY MONITORING WELL DECOMMISSIONING PLAN

Site # C734138

BMS Syracuse North Campus Restoration Area

East Syracuse, New York

December 2015

TEMPORARY MONITORING WELL DECOMMISSIONING PLAN

Site #C734138
BMS Syracuse North Campus Restoration Area
East Syracuse, New York

David A. Wright
New York State P.E. License No. 086954

I, *David A. Wright, certify that I am currently a New York State registered Professional Engineer and that this Temporary Monitoring Well Decommissioning Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).*

Prepared for:
Bristol-Myers Squibb Company
6000 Thompson Road
East Syracuse, New York 13057

Prepared by:
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Our Ref.:
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Date:
December 2015

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ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
BDA	Brownfield Development Area
BMS	Bristol-Myers Squibb Company
DOT	U.S. Department of Transportation
FSAP	Field Sampling and Analysis Plan
NYSDEC	New York State Department of Environmental Conservation
OBG	O'Brien & Gere Engineers, Inc.
RIWP	Remedial Investigation Work Plan
SVOC	Semi-volatile Organic Compound
TOGS	Technical and Operational Guidance Series
VOC	Volatile Organic Compound

1 INTRODUCTION

This Temporary Monitoring Well Decommissioning Plan (Decommissioning Plan) has been developed for the Bristol-Myers Squibb Company (BMS) Syracuse North Campus Restoration Area (New York State Department of Environmental Conservation [NYSDEC] Brownfield Development Area [BDA] Site #C734138) located at 6000 Thompson Road in East Syracuse, New York. The BDA is subject to an agreement between BMS and NYSDEC under the Brownfield Cleanup Program. As proposed in the NYSDEC-approved Remedial Investigation Work Plan (RIWP) (O'Brien & Gere Engineers, Inc. [OBG], 2013a), 91 temporary monitoring wells were installed during Phase 1 investigation activities in the BDA in 2013. Groundwater samples were collected from each temporary monitoring well in 2013 for laboratory analysis. Based on the Phase 1 analytical results, a second round of groundwater samples was collected from select wells during Phase 1A investigation activities in March 2015.

After review of the Phase 1 and Phase 1A groundwater sampling results, BMS proposes to decommission all 88 temporary monitoring wells remaining in the BDA (three wells were previously decommissioned), and to install additional monitoring wells of standard construction in specific locations and screened at various depth intervals as part of Phase 2 investigation activities. This Decommissioning Plan identifies the methods to be followed to decommission the temporary monitoring wells, and provides a preliminary identification of proposed Phase 2 monitoring wells to be installed within and downgradient of the BDA. A detailed Phase 2 Groundwater Investigation Plan is under development and is expected to be submitted for NYSDEC approval in the first half of 2016.

2 WELL DECOMMISSIONING METHODS

The temporary monitoring wells will be decommissioned in accordance with the NYSDEC-approved Field Sampling and Analysis Plan (FSAP) (OBG, 2013b), NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy (NYSDEC, 2009), and the Temporary Monitoring Well Decommissioning Procedures provided as Appendix A.

As identified in Table 1 and shown on Figure 1, the temporary monitoring wells will be decommissioned using one of two methods: grouting the well in place and removing the upper three feet of well materials, or overdrilling and grouting the well. Selection of the decommissioning method for each temporary monitoring well was based on one or more the following criteria:

- Location of the temporary monitoring well within an Area of Concern (AOC), which for reference is identified as an area in the BDA where, during the Phase 1 and Phase 1A activities, groundwater concentrations of volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCs) were found more than an order of magnitude above the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Water Guidance Values (NYSDEC, 1998-2009).
- The geologic unit(s) in which the temporary monitoring well is screened or screened across.
- Select well couplets to be overdrilled.

Each temporary monitoring well will be inspected prior to decommissioning for evidence of damage or failure of the well seal. If there is evidence of damage or failure of the well seal, in the form of subsidence around the well, the well will be overdrilled, even if identified to be grouted in place.

2.1 Grout-in-Place

Fifty-five temporary monitoring wells are identified to be grouted in place. Each well will be grouted in place from the bottom up, to within 3 feet below ground surface, using ½-inch diameter tremie tubing. Once the well has been grouted in place, the surface completion and the upper 3 feet of well casing materials will be removed using hand tools. The interval from 3 feet to the ground surface will be backfilled with clean fill or gravel, and restored to surrounding ground surface conditions.

2.2 Overdrill

Thirty-three temporary monitoring wells are identified to be overdrilled. Prior to overdrilling, each well will be filled with grout from the bottom up, to within 3 feet below ground surface, using ½-inch diameter tremie tubing. The grout will be allowed to set for a minimum of two hours. After the grout has been allowed to set, the well will be overdrilled using the same diameter auger used to install each well. For installation of boreholes with two wells (except T-5), 4¼-inch inside diameter augers were used; 3¼-inch inside diameter augers were used for T-5 and all other boreholes. After the well has been overdrilled to remove the well materials, the borehole will be grouted, using a tremie pipe, from the bottom of the borehole to within 3 feet below ground surface. The interval from 3 feet to the ground surface will be backfilled with clean fill or gravel, and restored to surrounding ground surface conditions.

2.3 Waste Materials

Waste materials generated during the temporary monitoring well decommissioning activities will include displaced groundwater, well construction materials, and soil excavated to remove the upper 3 feet of well casings. Displaced groundwater will be removed from the sump around the well (resulting from the removal of well head materials) with a bailer and placed into a 55-gallon Department of Transportation (DOT)-approved drum. The waste materials will be profiled and managed in accordance with the FSAP.

3 MONITORING WELL INSTALLATION

Phase 2 monitoring wells are anticipated to be installed in 2016, pending NYSDEC approval of a Phase 2 Groundwater Investigation Plan. The purpose of the Phase 2 Groundwater Investigation Plan is to:

- Close data gaps relative to groundwater quality downgradient of AOCs identified during Phase 1 and Phase 1A investigations;
- Improve horizontal and vertical delineation of constituents within or downgradient of AOCs;
- Investigate till continuity and bedrock conditions near or downgradient of AOCs; and
- Provide an initial network of downgradient BDA perimeter monitoring points for long term evaluation of groundwater conditions.

Additional monitoring well installations are anticipated beyond the preliminary proposed Phase 2 locations shown on Figure 2, dependent upon future sampling results.

4 REPORTING

As described in the Temporary Monitoring Well Decommissioning Procedures (Appendix A), a Well Decommissioning Record Form will be completed for each well and will be included in the corresponding monthly progress report and in the Phase 1A Data Summary Report.

5 SCHEDULE

Temporary monitoring well decommissioning will be initiated within 45 days of NYSDEC approval of this Decommissioning Plan, subject to weather and ground surface conditions.

6 REFERENCES

NYSDEC. 1998. Technical & Operational Guidance Series 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June. Available online at: http://www.dec.ny.gov/docs/water_pdf/togs111.pdf

NYSDEC. 2000. Addendum to Technical & Operational Guidance Series 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. April. Available online at: http://www.dec.ny.gov/docs/water_pdf/togs111table1.pdf

NYSDEC. 2004. Addendum to Technical & Operational Guidance Series 1.1.1. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June. Available online at: http://www.dec.ny.gov/docs/water_pdf/June04togs111.pdf

NYSDEC. 2009. New York State Department of Environmental Conservation (NYSDEC) CP-43: Groundwater Monitoring Well Decommissioning Policy. November. Available online at: http://www.dec.ny.gov/docs/remediation_hudson_pdf/cp43mwdecomm.pdf

NYSDEC. 2010. DER-10 Technical Guidance for Site Investigation and Remediation. May 3. Available online at: http://www.dec.ny.gov/regulations/67386.html

OBG. 2013a. Remedial Investigation Work Plan: BMS Syracuse North Campus Restoration Area Site No. C734138. March 2013.

OBG. 2013b. Remedial Investigation Work Plan: BMS Syracuse North Campus Restoration Area Site No. C734138. Field Sampling and Analysis Plan. March 2013.

OBG. 2013c. Remedial Investigation Work Plan: BMS Syracuse North Campus Restoration Area Site No. C734138. Quality Assurance Project Plan. March 2013.

TABLES

Table 1
Well Decommissioning Methods and Justification

Temporary Monitoring Well Decommissioning Plan
Site #C734138 - BMS Syracuse North Campus Restoration Area
East Syracuse, NY

Temporary Monitoring Well ID	Proposed Decommissioning Method		Decommissioning Method Selection Support		Temporary Monitoring Well Construction Information			Temporary Monitoring Well Installation Reference Information		
	Grout-in-Place	Overdrill	Is the Temporary Monitoring Well in an AOC; Which AOC?	Is the Temporary Monitoring Well Screened Across Geologic Units?	Top of Till (feet bgs)	Well Screen Interval (feet bgs)	Drilling Method	Maximum Soil PID Reading During Installation (ppm)	Depth Interval (feet bgs) of Maximum PID Reading	Drilling Observations/Comments
B55-1	1		BLDG 55	No	-	3.03-11.87	Direct push	0	-	No impacts.
B55-2	1		BLDG 55	No	-	3-11.87	Direct push	1,854	10.6-11	Strong odor between 10.6 and 11 feet bgs.
BLD 1-1A		1	4/5/8 Alleyway	Yes	17.4	11-20.7	HSA	0	-	No impacts.
BLD 1-2		1	4/5/8 Alleyway	Yes	15.3	9-18.7	HSA	0	-	No impacts.
BLD 1-3	1		No	Yes	6	4-13.7	HSA	0	-	Black staining 4.4 to 5.4 feet bgs.
BLD 1-4A	1		4/5/8 Alleyway	No	20	10-19.7	HSA	1	10-12	No impacts.
BLD 4A-1		1	4/5/8 Alleyway	Yes	10	6-15.7	HSA, Air Rotary	2.1	2-4	No impacts.
BLD 4B-1		1	4/5/8 Alleyway	Yes	12	6-15.7	HSA, Air Rotary	3.3	6-8	No impacts.
BLD 5-1		1	4/5/8 Alleyway	Yes	11.1	10.3-20	HSA	0.3	14-16	Seam of black staining 19 to 19.1 feet bgs.
BLD 5A-1		1	4/5/8 Alleyway	Yes; however, screen is less than a foot into till unit.	13.7	4.3-14	HSA	0	-	No impacts.
BLD 8-1	1		4/5/8 Alleyway	No	14.2	4.25-13.95	HSA	0	-	Black staining with no odor at 7 feet bgs.
BLD 8-2		1	4/5/8 Alleyway	Yes	8.5	3.25-10.05	HSA	1.7	0-2	No impacts.
BLD 8A-1	1		4/5/8 Alleyway	No	14	4-13.7	HSA	0	-	No impacts.
BLD 8C-1		1	4/5/8 Alleyway	Yes	9.5	4-13.7	HSA	2.3	2-4	Odor from 8 to 10 feet bgs.
BLD 8D-1	1		No	Yes	10.3	4-13.7	HSA	0	-	No impacts.
BLD 9-1	1		No	No	9.8	4-9.7	HSA	0.5	6-8	Black staining from 7.6 to 7.9 feet bgs.
BLD 9A-1		1	CHAPA Area	Yes	10.5	4.3-13.9	HSA	0	-	No impacts.
BLD 9B-1	1		No	No	13.1	3-12.7	HSA	0	-	Black staining from 11 to 13.1 feet bgs.
BLD 20-1	1		No	No	25.3	6.85-16.55	Direct push	0	-	No impacts.
BLD 21A-1	1		4/5/8 Alleyway	Yes; however, screen is less than a foot into till unit.	17.4	8.3-18	HSA	0	-	No impacts.
BLD 24-1	1		No	Yes	16.8	5.9-15.6	HSA	0	-	No impacts.

Table 1
Well Decommissioning Methods and Justification

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East Syracuse, NY

Temporary Monitoring Well ID	Proposed Decommissioning Method		Decommissioning Method Selection Support		Temporary Monitoring Well Construction Information			Temporary Monitoring Well Installation Reference Information		
	Grout-in-Place	Overdrill	Is the Temporary Monitoring Well in an AOC; Which AOC?	Is the Temporary Monitoring Well Screened Across Geologic Units?	Top of Till (feet bgs)	Well Screen Interval (feet bgs)	Drilling Method	Maximum Soil PID Reading During Installation (ppm)	Depth Interval (feet bgs) of Maximum PID Reading	Drilling Observations/Comments
BLD 24A-1	1		No	Yes	16.2	7.9-17.62	HSA	0	-	No impacts.
BLD 29-1	1		No	Yes	10.5	3.8-13.5	HSA	0	-	No impacts.
BLD 36-1		1	4/5/8 Alleyway	Yes	10.2	3.8-13.5	HSA	0	-	No impacts.
BLD 41-1		1	No	Yes	14.25	15-24.7	HSA, Air Rotary	2.1	12-14	No impacts. Air rotary needed to drill through concrete.
BLD 43-1	1		No	Yes	14.3	6-15.7	HSA	0	-	No impacts.
BLD 45-1	1		No	Yes	7.2	4-13.7	HSA	0.3	2-4	No impacts.
BLD 46-1	1		No	Yes	9	4-13.78	HSA	0	-	No impacts.
BLD 56-1D		1	No	No	12.3	31.7-36.64	HSA	0.6	24-26	Other than the low PID reading, no impacts. Top of rock at 36 feet bgs.
BLD 56-1S		1	No	No		13.7-23.3				
BLD 62-1D		1	CHAPA Area	No	14	34.65-36.53	HSA	67	28-30	Top of rock at 35.5 feet bgs.
BLD 62-1S		1	CHAPA Area	No		20-29.7				
BLD 68-1	1		No	No	9.8	2-9.7	HSA	1.4	2-4	No impacts.
DS 2-1	1		No	No	15	3-12.7	HSA	0.2	8-10	No impacts.
DS 2-3	1		No	Yes	7	2-11.7	HSA	0	-	No impacts.
PAN 1-1	1		No	No	14	16-25.7	HSA	4.3	6-8	No impacts observed.
PAS 1-1	1		No	No	13.5	24-33.7	HSA	0	-	No impacts; well was installed at BMS' request.
PAS 1-2	1		No	Yes; however, screen is less than a foot into till unit.	13	6-13.7	HSA	0	-	No impacts observed; no recovery from 4 to 10 feet bgs.
PR 1-1		1	4/5/8 Alleyway	Yes	12.9	5-14.7	HSA	5.4	4-6	Trace black staining from 6.6 to 6.8 feet bgs.
PR 5A-1		1	No	Yes	8	4-13.7	HSA	0.4	6-8	No impacts.
PR 8C-1	1		No	Yes	11	4-13.7	HSA	2.6	12-14	No impacts.
PR 9A-1	1		No	Yes	8	4-13.7	HSA	0	-	No impacts.

Table 1
Well Decommissioning Methods and Justification

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Temporary Monitoring Well ID	Proposed Decommissioning Method		Decommissioning Method Selection Support		Temporary Monitoring Well Construction Information			Temporary Monitoring Well Installation Reference Information		
	Grout-in-Place	Overdrill	Is the Temporary Monitoring Well in an AOC; Which AOC?	Is the Temporary Monitoring Well Screened Across Geologic Units?	Top of Till (feet bgs)	Well Screen Interval (feet bgs)	Drilling Method	Maximum Soil PID Reading During Installation (ppm)	Depth Interval (feet bgs) of Maximum PID Reading	Drilling Observations/Comments
PR24A-1	1		No	Yes	10	6-15.7	HSA	0	-	No impacts.
PR 25-1	1		No	Yes	6.5	4-13.7	HSA	0	-	No impacts.
SR-2	1		No	No	3	4.25-13.95	HSA	0	-	Water not observed during drilling; well set based on info from SR-1. Well installed at this location at the request of the NYSDEC and BMS for Building 52-related issues.
SR-3	1		No	No	10.5	2-9.7	HSA	0	-	Staining from 7 to 9 feet bgs.
SR-4	1		No	Yes	11	4-13.7	HSA	0	-	Staining from 8 to 10 feet bgs.
SR-5	1		No	Yes	10	4-13.7	HSA	0	-	No impacts.
T-1	1		No	Yes	14.4	6-15.7	HSA	0	-	No impacts.
T-2		1	4/5/8 Alleyway	Yes	13.5	6-15.7	HSA	2.1	4-6	Black discoloration at 13.3 to 13.5 feet bgs.
T-3		1	4/5/8 Alleyway	Yes	8.2	4-13.7	HSA	0	-	Black staining at 7.6 to 8.2 feet bgs.
T-4	1		4/5/8 Alleyway	No	14.8	5-14.7	HSA	124	8-10	PID readings less than 10 ppm below 12 feet bgs.
T-5D		1	4/5/8 Alleyway	No	6.5	32-41.7	HSA	149	28-30	Odor and elevated PID readings start at 12 feet bgs and continue until 47 feet bgs (possible top of rock).
T-5S		1	4/5/8 Alleyway	No		12.25-21.95				
T-6		1	4/5/8 Alleyway	No	15	15-24.7	HSA	1.9	10-12	No impacts.
T-7	1		No	Yes	14.1	8-17.7	HSA	0.8	4-6	No impacts.
T-9		1	4/5/8 Alleyway	Yes	17.4	16-25.7	HSA	6.8	16-18	Trace black staining from 17 to 17.4 feet bgs.
T-10	1		No	Yes	7.5	4.3-13.6	HSA	0	-	Black staining and trace sheen from 5 to 7.5 feet bgs.
T-11	1		No	Yes	8.5	4-13.7	HSA	0	-	Black staining at 6.2 feet bgs.
T-12		1	4/5/8 Alleyway	Yes	12	4-13.7	HSA	4	6-8	Black staining and trace sheen from 6.3 to 7.8 feet bgs. Dye test on soil sample for NAPL was negative.
T-13	1		No	Yes	7.8	4-13.7	HSA	0	-	Black staining from 5.7 to 6.1 feet bgs.
T-15	1		No	Yes	11	4-13.7	HSA	0	-	Spotty black staining and MGP-like odor from 2 to 4 feet bgs.

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Site #C734138 - BMS Syracuse North Campus Restoration Area
East Syracuse, NY

Temporary Monitoring Well ID	Proposed Decommissioning Method		Decommissioning Method Selection Support		Temporary Monitoring Well Construction Information			Temporary Monitoring Well Installation Reference Information		
	Grout-in-Place	Overdrill	Is the Temporary Monitoring Well in an AOC; Which AOC?	Is the Temporary Monitoring Well Screened Across Geologic Units?	Top of Till (feet bgs)	Well Screen Interval (feet bgs)	Drilling Method	Maximum Soil PID Reading During Installation (ppm)	Depth Interval (feet bgs) of Maximum PID Reading	Drilling Observations/Comments
T-16	1		No	Yes	13	8-17.7	HSA, roller bit, core barrel	0	-	Spotty black staining from 7.5 to 10 feet bgs. Roller bit and core barrel needed to advance boring through concrete.
T-17	1		No	Yes	9.5	4-13.7	HSA, roller bit, core barrel	0	-	Black staining and chemical odor from 4 to 9 feet bgs. Roller bit and core barrel needed to advance boring through concrete.
T-18	1		No	Yes	12	4-13.7	HSA	0	-	Black staining and MGP-like odor from 6 to 8 feet bgs.
T-20D		1	No	Yes	12	17.9-27.6	HSA	0	-	No impacts.
T-20S		1	No	Yes		4-13.7				
T-22D		1	No	Yes	11.3	19-28.7	HSA	0	-	Possible black staining from 4 to 4.1 feet bgs.
T-22S		1	No	Yes		3-15				
T-24	1		No	Yes	11	4-13.7	HSA	0	-	Slight chemical odor from 4 to 9 feet bgs; greenish staining at 7.5 feet bgs.
T-25	1		No	Yes; however, screen is less than a foot into till unit.	11.3	2-11.7	HSA	0	-	Black staining from 7.5 to 7.7 feet bgs.
T-26	1		No	Yes	11	4-13.7	HSA	0	-	No impacts.
T-27		1	CHAPA Area	Yes	6.5	2-9.7	HSA	587.6	2-4	PID readings below 20 ppm from 4 feet bgs to end of boring.
T-28		1	CHAPA Area	Yes	15.1	6-15.7	HSA	73.4	14-16	Sheen 13.8 to 15.1 feet bgs; till at 15.1 feet bgs and no sheen or impacts in till.
T-29	1		CHAPA Area	No	13.8	3-12.7	HSA	596	2-4	PID readings above 100 ppm from 2 to 10 feet bgs. PID readings in the till were 0 ppm.
T-30	1		No	Yes	7.3	4-11.7	HSA	0	-	Green/gray discoloration at 4 feet bgs.
T-31	1		No	Yes	6.7	4-11.7	HSA	0	-	No impacts.
T-32	1		No	Yes	8	4-13.7	HSA	0	-	No impacts.
T-33		1	CHAPA Area	Yes	9.5	4-13.7	HSA	0	-	Sheen on augers from 8 to 11 feet bgs but not observed in the sample.
T-34		1	CHAPA Area	Yes	8	6-15.7	HSA	0	-	Purple staining from 6.5 to 6.8 feet bgs with a banana-like odor.
T-35	1		No	Yes	10.5	3-12.7	HSA	0	-	9.5 to 10.5 feet bgs black staining and odor.
T-36		1	CHAPA Area	Yes	8	4-13.7	HSA	142.2	8-10	Purple staining from 6.2 feet bgs and 8 to 11.8 feet bgs and odor.

Table 1
Well Decommissioning Methods and Justification

Temporary Monitoring Well Decommissioning Plan
Site #C734138 - BMS Syracuse North Campus Restoration Area
East Syracuse, NY

Temporary Monitoring Well ID	Proposed Decommissioning Method		Decommissioning Method Selection Support		Temporary Monitoring Well Construction Information			Temporary Monitoring Well Installation Reference Information		
	Grout-in-Place	Overdrill	Is the Temporary Monitoring Well in an AOC; Which AOC?	Is the Temporary Monitoring Well Screened Across Geologic Units?	Top of Till (feet bgs)	Well Screen Interval (feet bgs)	Drilling Method	Maximum Soil PID Reading During Installation (ppm)	Depth Interval (feet bgs) of Maximum PID Reading	Drilling Observations/Comments
T-37	1		No	Yes; however, screen is less than a foot into till unit.	15.2	6-15.7	HSA	4.1	10-12	No impacts.
T-38	1		No	Yes	10.6	4-13.7	HSA	0	-	No impacts.
T-39	1		No	Yes	8.4	4-13.7	HSA	0	-	No impacts.
T-40	1		No	Yes	8	4-13.7	HSA	178	6-8	Purple staining observed from 6 to 8.5 feet bgs.
T-41	1		No	No	14	20.5-30.2	HSA	0	-	No impacts; top of rock at 30.5 feet bgs.
T-42	1		No	Yes; however, screen is less than a foot into till unit.	15.5	6-15.7	HSA	8.8	14-16	Odor from 8.4 feet bgs to 12 feet bgs.
Total	**55**	**33**								

Notes:

1) Temporary monitoring well locations shown on Figure 1.
2) If evidence of well seal damage or failure is observed during pre-decommissioning inspection, the monitoring well will be overdrilled.
3) Well screen interval does not include the end cap.
4) Interpretation as to geological material types based on material characteristics, including particle grain size and grain size distribution, density and consistency, color, moisture content, stratigraphic position, and professional judgment.
5) Abbreviations:
   AOC = Area of Concern
   bgs = below ground surface
   HSA = hollow stem auger
   NAPL = Non-aqueous phase liquid
   NYSDEC = New York State Department of Environmental Conservation
   PID = photoionization detector
   ppm = parts per million

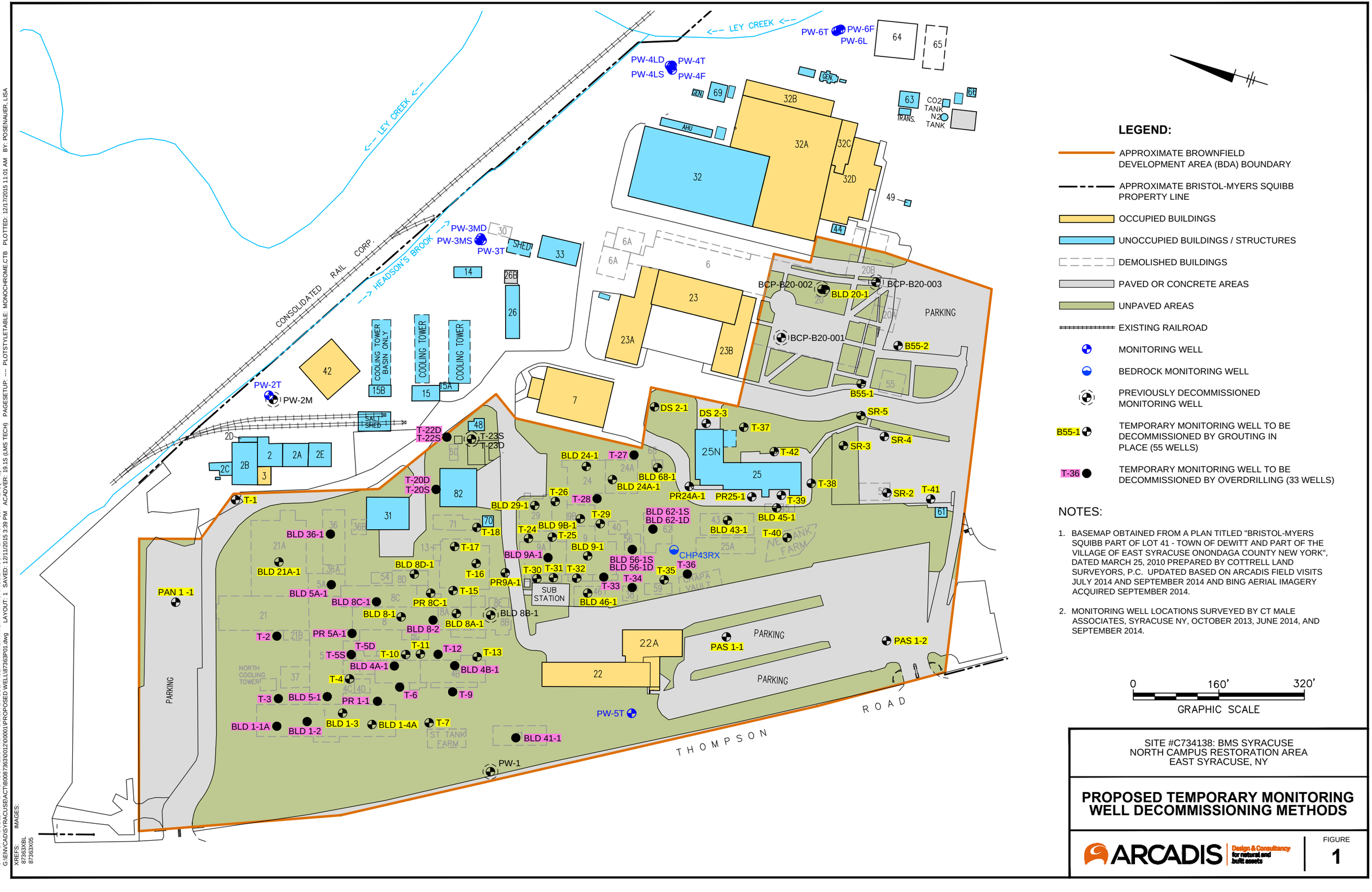
Table 2
Preliminary Proposed Phase 2 Monitoring Wells

Temporary Monitoring Well Decommissioning Plan
Site #C734138 - BMS Syracuse North Campus Restoration Area
East Syracuse, NY

Proposed Well Locations	Water Table Monitoring Well	Deep Till Monitoring Well	Bedrock Monitoring Well	Justification
B55-2R well cluster	1	1		Replace temporary monitoring well B55-2 (BLDG 55 AOC) and provide vertical delineation.
BLDG 55 downgradient water table	1			Provide monitoring downgradient of BLDG 55 AOC.
BLD 62-1DR, BLD 62-1SR, and T-36-R	1	2		Replace temporary monitoring wells BLD 62-1D, BLD 62-1S, and T-36, and monitor CHAPA AOC.
CHAPA AOC well cluster	1	1	1	Provide monitoring downgradient of CHAPA AOC within the BDA area.
BLD 36-1R	1			Replace temporary monitoring well BLD 36-1 and provide additional monitoring downgradient of 4/5/8 Alleyway AOC.
T-5SR / T-5DR well cluster	1	2		Replace temporary monitoring wells in T-5 cluster and provide monitoring within 4/5/8 Alleyway AOC.
4/5/8 Alleyway AOC well cluster	1	1	1	Provide monitoring downgradient of 4/5/8 Alleyway AOC within the BDA area.
Eight perimeter well clusters	7	7	7	Provide monitoring upgradient and downgradient of the BDA area. Clusters will include a water table well and a deep till well (if geology accommodates). A bedrock well will also be installed at select clusters.
Total	**14**	**14**	**9**	

Notes:
1) Monitoring well locations are shown on Figure 2, and are preliminary; a revised table will be provided in the Phase 2 Groundwater Investigation Plan.
2) In addition to the monitoring wells identified above, three monitoring wells will be installed outside of the Brownfield Development Area (BDA), as shown on Figure 2.
3) Abbreviations:
AOC = Area of Concern
BDA = Brownfield Development Area

FIGURES



LEGEND:

- APPROXIMATE BROWNFIELD DEVELOPMENT AREA (BDA) BOUNDARY
- APPROXIMATE BRISTOL-MYERS SQUIBB PROPERTY LINE
- OCCUPIED BUILDINGS
- UNOCCUPIED BUILDINGS / STRUCTURES
- DEMOLISHED BUILDINGS
- PAVED OR CONCRETE AREAS
- UNPAVED AREAS
- EXISTING RAILROAD
- MONITORING WELL
- BEDROCK MONITORING WELL
- PREVIOUSLY DECOMMISSIONED MONITORING WELL
- B55-1 TEMPORARY MONITORING WELL TO BE DECOMMISSIONED BY GROUTING IN PLACE (55 WELLS)
- T-36 TEMPORARY MONITORING WELL TO BE DECOMMISSIONED BY OVERDRILLING (33 WELLS)

NOTES:

1. BASEMAP OBTAINED FROM A PLAN TITLED "BRISTOL-MYERS SQUIBB PART OF LOT 41 - TOWN OF DEWITT AND PART OF THE VILLAGE OF EAST SYRACUSE ONONDAGA COUNTY NEW YORK", DATED MARCH 25, 2010 PREPARED BY COTTRELL LAND SURVEYORS, P.C. UPDATED BASED ON ARCADIS FIELD VISITS JULY 2014 AND SEPTEMBER 2014 AND BING AERIAL IMAGERY ACQUIRED SEPTEMBER 2014.
2. MONITORING WELL LOCATIONS SURVEYED BY CT MALE ASSOCIATES, SYRACUSE NY, OCTOBER 2013, JUNE 2014, AND SEPTEMBER 2014.

0 160' 320'

GRAPHIC SCALE

SITE #C734138: BMS SYRACUSE
NORTH CAMPUS RESTORATION AREA
EAST SYRACUSE, NY

PROPOSED TEMPORARY MONITORING WELL DECOMMISSIONING METHODS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1

CITY: SYRACUSE, NY DIV/GROUP: EBC-IM/DV DB/LD: L.POSENAUER PM: D.WRIGHT TM: JA.ROBERTSON LYR: ON=*;OFF=REF, (FRZ)
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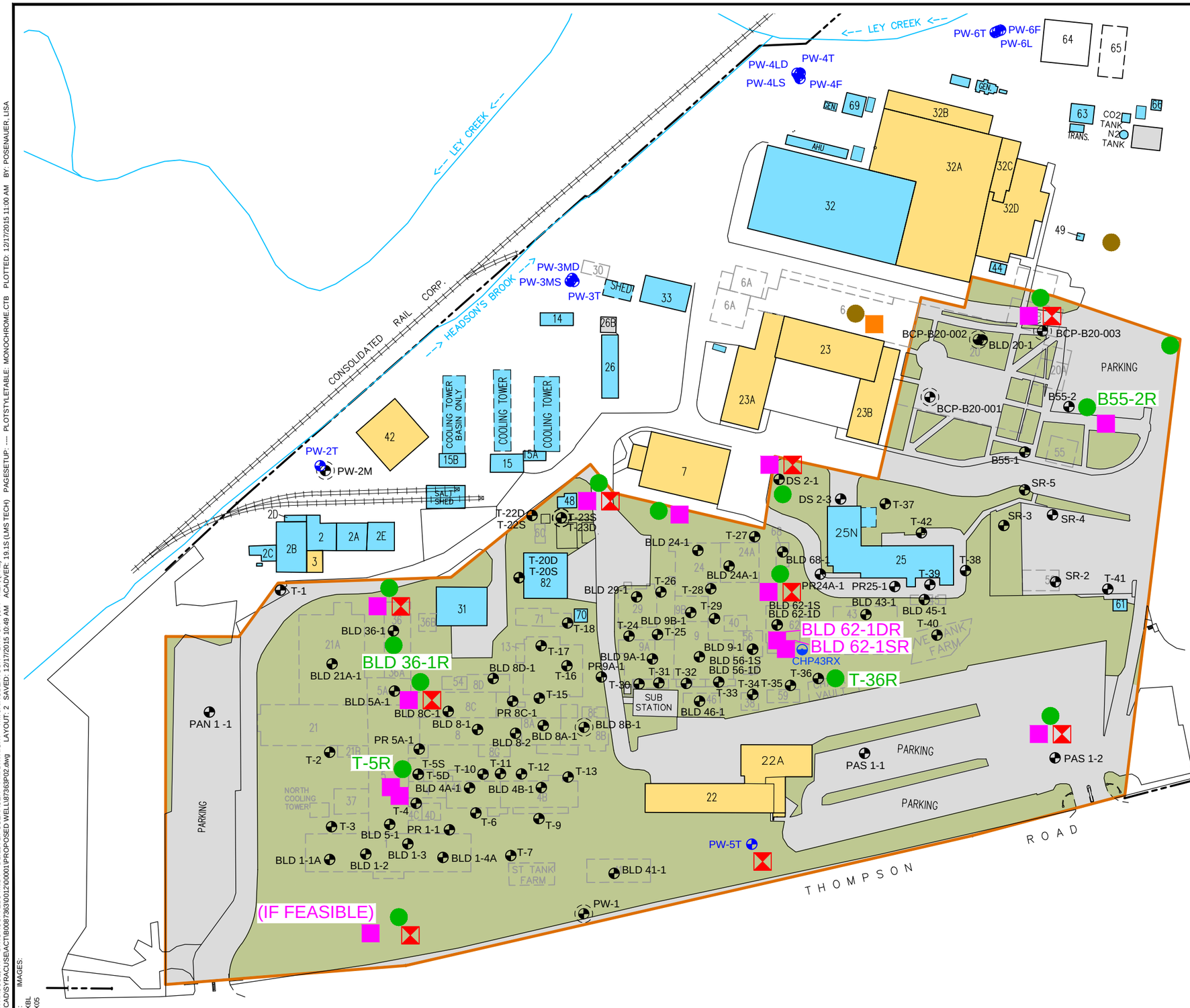
87363XBL
87363X05
IMAGES:



LEGEND:

- APPROXIMATE BROWNFIELD DEVELOPMENT AREA (BDA) BOUNDARY
- APPROXIMATE BRISTOL-MYERS SQUIBB PROPERTY LINE
- OCCUPIED BUILDINGS
- UNOCCUPIED BUILDINGS / STRUCTURES
- DEMOLISHED BUILDINGS
- PAVED OR CONCRETE AREAS
- UNPAVED AREAS
- EXISTING RAILROAD
- MONITORING WELL
- BEDROCK MONITORING WELL
- TEMPORARY MONITORING WELL TO BE DECOMMISSIONED
- PREVIOUSLY DECOMMISSIONED MONITORING WELL
- PROPOSED WATER TABLE MONITORING WELL
- PROPOSED DEEP TILL MONITORING WELL OR MONITORING WELLS
- PROPOSED BEDROCK MONITORING WELL
- PROPOSED NON-BDA WATER TABLE MONITORING WELL
- PROPOSED NON-BDA DEEP TILL MONITORING WELL

NOTES:

1. BASEMAP OBTAINED FROM A PLAN TITLED "BRISTOL-MYERS SQUIBB PART OF LOT 41 - TOWN OF DEWITT AND PART OF THE VILLAGE OF EAST SYRACUSE ONONDAGA COUNTY NEW YORK", DATED MARCH 25, 2010 PREPARED BY COTTRELL LAND SURVEYORS, P.C. UPDATED BASED ON ARCADIS FIELD VISITS JULY 2014 AND SEPTEMBER 2014 AND BING AERIAL IMAGERY ACQUIRED SEPTEMBER 2014.
2. MONITORING WELL LOCATIONS SURVEYED BY CT MALE ASSOCIATES, SYRACUSE NY, OCTOBER 2013, JUNE 2014, AND SEPTEMBER 2014.
3. PROPOSED MONITORING WELLS WITH IDENTIFICATION REPLACE A TEMPORARY MONITORING WELL.
4. PROPOSED MONITORING WELL LOCATIONS AND DEPTH INTERVALS ARE PRELIMINARY AND SUBJECT TO CHANGE. REFER TO PHASE 2 GROUNDWATER INVESTIGATION PLAN (CURRENTLY UNDER DEVELOPMENT) FOR FINAL PROPOSED LOCATIONS AND DEPTH INTERVALS.

0 160' 320'

GRAPHIC SCALE

SITE #C734138: BMS SYRACUSE
NORTH CAMPUS RESTORATION AREA
EAST SYRACUSE, NY

PRELIMINARY PROPOSED MONITORING WELL LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 2

CITY: SYRACUSE, NY DIV/GROUP: EBC-IM/DV DB/LD: L.POSENAUER PM: D.WRIGHT TM: J.A.ROBERTSON LYR: ON=*;OFF=REF,(FRZ)
G:\ENVCAD\SYRACUSE\ACT\B0087363\00120\0001\PROPOSED WELL\87363P02.dwg LAYOUT: 2 SAVED: 12/17/2015 10:49 AM ACADVER: 19.1S (LMS TECH)
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XREFS:
87363XBL
87363X05
IMAGES:

APPENDIX A

Temporary Monitoring Well Decommissioning Procedures

Temporary Monitoring Well Decommissioning Procedures

Site #C734138

BMS Syracuse North Campus Restoration Area

East Syracuse, New York

December 2015

I. Scope and Application

This document describes the procedures to decommission temporary monitoring wells at the Bristol-Myers Squibb Company (BMS) Syracuse North Campus Restoration Area (New York State Department of Environmental Conservation [NYSDEC] Brownfield Development Area [BDA] Site #C734138) located at 6000 Thompson Road in East Syracuse, New York. As identified in the Temporary Monitoring Well Decommissioning Plan, the temporary monitoring wells will be decommissioned using one of two methods: grout-in-place or overdrilling. The procedures apply to 1-inch temporary monitoring wells installed as part of the BDA Phase 1 investigation activities in 2013, including both single wells and couplet wells (two wells in the same borehole), and are consistent with NYSDEC CP-43 Groundwater Monitoring Well Decommissioning Policy (NYSDEC, 2009) and the American Society for Testing and Materials (ASTM) Standard Guide for Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities.

II. Personnel Qualifications

Temporary monitoring wells will be decommissioned using a drill rig operated by a New York State Registered Water Well Contractor, as directed by an experienced geologist with a minimum of four years field experience.

III. Equipment List

The following materials, as required, shall be available during pre-decommissioning and decommissioning activities:

- Site Health and Safety Plan (HASP);
- Level D personal protective equipment (PPE) as described in the HASP;
- Four-gas meter, equipped with an 11.7 eV photoionization detector (PID) bulb;
- PIDs equipped with telemetry data logging and associated equipment, as described in the Community Air Monitoring Plan (CAMP; refer to 2013 O'Brien & Gere Engineers, Inc. (OBG) Remedial Investigation Work Plan [RIWP]);
- Boring and well construction logs for the temporary monitoring wells to be decommissioned;
- Well Decommissioning Record Form (see Attachment 1) and field notebook;
- Well keys;
- Water level probe;
- Decontamination supplies and materials;

- Tremie pipe and tubing;
- Portland Type I cement;
- Powdered bentonite;
- Potable water; and
- 55-gallon DOT drums for waste collection.

IV. Procedures

The proposed decommissioning method for each temporary monitoring well is identified in the Temporary Monitoring Well Decommissioning Plan. The grout-in-place and overdrilling methods are described below.

Grout-in-Place Method

With the grout-in-placed method, the well screen and well point are left in place, and the grout seal penetrates the surrounding filter pack. Due to the small diameter of the temporary monitoring wells, the well screen will not be perforated.

The decommissioning process will consist of the following steps:

1. The following activities should be performed to identify the location, construction, and condition of the well, and to determine the appropriate equipment to be utilized based on the depth, diameter, and access to the well:
    - Review the existing monitoring well log to confirm the total depth of the well.
    - Locate the well in the field.
    - Identify if the decommissioning equipment can access the well and/or if special considerations are necessary to gain access to prevent damage to the ground surface or for safety.
    - Conduct total depth measurements and water level measurements.
    - Inspect the well and groundsurface around the well for evidence of well seal failure in the form of subsidence. If the well seal is questionable, the well decommissioning method will be changed to overdrilling.
    - Calculate the volume of the well that will need to be filled, using the field measurements and the formula provided in Section VI.
    - Record all observations and measurements.

2. Remove the protective casing (i.e. stick up protective casing or flush mount well cover and concrete pad) and well casing to a depth of approximately 3 feet below ground surface (bgs), if possible.

3. Prepare a neat cement grout mix consisting of the following approximate ratio: 94 pounds Type I Portland cement, 3.9 pounds powdered bentonite, and 7.8 gallons potable water. The amount of water used in the mixture may be adjusted as needed due to ambient temperature conditions so that the mixture is flowable.

4. Place the neat cement grout in the well casing via the tremie method (i.e., the grout will be pumped from the bottom of the well upward) using ¾-inch PVC piping and tubing. The grout will be added until the well is filled to above the top of the well casing remaining in place (i.e., approximately 3 feet bgs). Verify that the amount of grout added equals or exceeds the calculated volume of the void to be filled.

5. Complete the Well Decommissioning Record Form (Attachment 1).

Overdrilling Method

The decommissioning process will consist of the following steps:

1. The following activities should be performed to identify the location, construction, and condition of the well, and to determine the appropriate equipment to be utilized based on the depth, diameter, and access to the well:

    - Review the existing monitoring well log to confirm the total depth of the well.
    - Locate the well in the field.
    - Identify if the decommissioning equipment can access the well and/or if special considerations are necessary to gain access to prevent damage to the ground surface or for safety.
    - Conduct total depth measurements and water level measurements.
    - Calculate the volume of the well and borehole that will need to be filled, using the field measurements and the formula provided in Section VI.
    - Record all observations and measurements.

2. Remove the protective casing (i.e. stick up protective casing or flush mount well cover and concrete pad).

3. Fill the well with grout following the Grout-in-Place Method (Steps 3 and 4) and allow the grout to set for approximately two hours.

4. Advance a hollow-stem auger over the well casing to the bottom of the original borehole.

5. Place the neat cement grout in the borehole via tremie method (i.e., the grout will be pumped from the bottom of the borehole upward) at the same time the hollow-stem augers are removed from the borehole. Grout will be added until the borehole is filled to approximately 3 feet bgs. Verify that the amount of grout added equals or exceeds the calculated volume of the void to be filled. The grout will be allowed to set for a minimum of 24 hours and the remainder of the borehole will be filled with concrete and/or other surface finish materials.

6. Complete the Well Decommissioning Record Form (Attachment 1).

V. Waste Management

Waste materials generated during the temporary monitoring well decommissioning will include displaced groundwater, well construction materials, and soil excavated to remove the upper 3 feet of well casings. Displaced groundwater will be removed from the sump around the well with a bailer and placed into a 55-gallon DOT drum. All solid waste will be containerized in drums or placed in a roll-off for offsite disposal. The waste materials will be profiled and managed in accordance with the 2013 OBG Field Sampling and Analysis Plan (FSAP).

VI. Well/Borehole Volume Calculation

Volume of well/borehole (in gallons) =

3.14 TIMES radius (in feet) TIMES radius (in feet) TIMES length (in feet) TIMES 7.48 (gallons per cubic foot)

VII. References

ASTM. D5299-99. Standard Guide for Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities.

NYSDEC. 2009. New York State Department of Environmental Conservation (NYSDEC) CP-43: Groundwater Monitoring Well Decommissioning Policy. November. Available online at: http://www.dec.ny.gov/docs/remediation_hudson_pdf/cp43mwdecomm.pdf

VIII. Attachment

Well Decommissioning Record Form

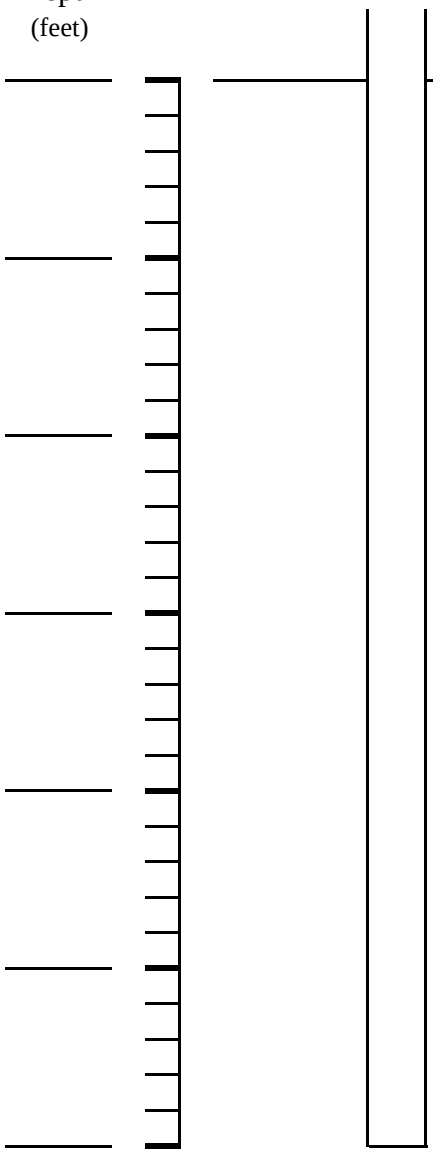
WELL DECOMMISSIONING RECORD

Site Name:	Well I.D.:
Site Location:	Driller:
Drilling Co.:	Inspector:
	Date:

DECOMMISSIONING DATA
(Fill in all that apply)

OVERDRILLING	
Interval Drilled	
Drilling Method(s)	
Borehole Dia. (in.)	
Temporary Casing Installed? (y/n)	
Depth temporary casing installed	
Casing type/dia. (in.)	
Method of installing	
CASING PULLING	
Method employed	
Casing retrieved (feet)	
Casing type/dia. (in)	
CASING PERFORATING	
Equipment used	
Number of perforations/foot	
Size of perforations	
Interval perforated	
GROUTING	
Interval grouted (FBLS)	
# of batches prepared	
For each batch record:	
Quantity of water used (gal.)	
Quantity of cement used (lbs.)	
Cement type	
Quantity of bentonite used (lbs.)	
Quantity of calcium chloride used (lbs.)	
Volume of grout prepared (gal.)	
Volume of grout used (gal.)	

WELL SCHEMATIC*



COMMENTS:

* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.

Drilling Contractor

Department Representative